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STUDY PROJECT

"MLRS": A ROCKET SYSTEM FOR THE MARINE CORPS

BY

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From a Marine Corps perspective, there are several clear requirements for an MLRS or MLRS-type weapon. In response to the threat of Warsaw Pact armor, supporting arms and air defense systems, the Marine Expeditionary Force (MEF) and Brigade (MEB) must be capable of isolating the force beachhead (FBH) or the main battle area. In addition, the presence of massed artillery, and rocket delivery systems must be aggressively attacked as far from the forward edge of the battle area (FEBA) as possible. My paper will use the historical background of rockets and evaluation of the Army's MLRS to establish the need

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"MLRS": A ROCKET SYSTEM FOR THE MARINE CORPS

An Individual Study Project
Intended for Publication

by

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ABSTRACT

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From a Marine Corps perspective, there are several clear requirements for an MLRS or MLRS-type weapon. In response to the threat of Warsaw Pact armor, supporting arms and air defense systems, the Marine Expeditionary Force(MEF) and Brigade(MEB) must be capable of isolating the force beachhead(FBH) or the main battle area. In addition, the presence of massed artillery, and rocket delivery systems must be aggressively attacked as far from the forward edge of the battle area (FEBA) as possible. My paper will use the historical background of rocket and evaluation of the Army's MLRS to establish the need for a Marine Corps General Support Rocket System.

"THE ORIENTING LINE"

The paper is intended to document, from the United States Marine Corps perspective, the historical trail of artillery rockets from their birth until the present day. The Marine Corps is presently drifting in and out of serious consideration of the procurement of what some might classify as the most lethal ground weapon system ever developed for the conventional battlefield, the Multiple Launch Rocket System, (MLRS). This study will provide a deep historical background against which the Corps must make its acquisition decision. This history of war rockets will follow a series of successively narrower paths from the origin of rockets to their coming of age as ground weapons during World War II. Finally, it will review the Marine Corps' vacillating interest in this kind of weaponry. This paper is intended to establish the need for a Marine Corps General Support Rocket System as well as set forth a concept for employment of the system after it is acquired.

Rationale

Due to the fact that Soviet arms sales have proliferated in the Third World to a great degree since World War II, the probability of meeting the armed forces of a country equipped with

Soviet systems -- whether in low, mid, or high intensity conflict -- is very great. With this prospect looming, "Does the Marine Corps require a rocket system to provide a massing and counter-fire capability to meet such a threat?" This paper will hopefully answer the question with an unequivocal "Yes!"

Requirements and Programming

In fact, a number of proposals for the acquisition and employment of such a system have been made over the years. These proposals have taken the form of Required Operational Capability (ROC) statement, which is a description of need for a piece of equipment with capabilities not already residing in the present inventory. However, these proposals have received little attention until recently. The most recent USMC Program Objective Memorandum (POM) has budgeted for the acquisition of three U.S. Army multiple launch rocket systems (MLRS) in Fiscal Year (FY) 93 and an additional five in FY 94 (1).

Proposals

Questions of adequacy of numbers were not addressed by this proposed acquisition. Unfortunately, this decision to acquire MLRS was based upon a cross section of several proposed employment concepts with no firm Required Operational Capabilities (ROC) being approved to date. One draft ROC proposes a General Support Rocket System (GSRS) battalion of eighteen launchers (2). While other proposals have surfaced, proposing anywhere from four

to eighteen launchers per Marine division, the recent POM proposed acquisition of U.S. Army MLRS systems will not provide adequate numbers of launchers. Therefore, attention must be focused on both the acquisition and employment of an optimum number of rocket launchers to adequately support the Marine Corps and on its concept of deployment as a Marine Expeditionary Force (MEF). I focus on the required numbers later in the paper.

HISTORY OF DEVELOPMENT AND USE OF ROCKET LAUNCHERS

The Origins of Rockets

Although black powder and firecrackers can be dated much earlier and are generally accepted as Chinese in origin, the year 1232 A.D. is the first validated record of rockets being used in combat. Most scholars agree on the date and the events surrounding this historical milestone. Even though there were earlier written accounts of Chinese "fire arrows" by the French missionaries in China, no specific dates are listed. Most of the French writings on the subject were based on second-hand reports and hearsay from missionaries who had been based in the Orient since the 16th century (3).

From 1232 on occasional mention of rockets appeared in historical writings of the Chinese, Arabs, French and others. The Chinese were known to have used them across the Asian continent from Persia (Iran) to Japan in battle usually against the Tartars or Mongols. Arab writers make mention of "Chinese fire arrows" from the mid-13th century on (4). It seems that the

Tartars and Mongols may have adopted the war rocket in its Chinese form after experiencing its effects in combat.

There are clear indications that rocketry quickly spread from Southern Asia to Europe and Russia by the 14th century through the spread of commerce and the increasing appearance of merchant sailing ships (5). By the 1420's, the French had already begun developing a tradition of war rocketry. They used rockets both in the defense of Orleans in 1429 and later at the siege of Pon-Andemer in 1449. Rockets in combat were again employed by France at Bordeaux and Gand in 1452 and 1453 respectively. Their effectiveness is a matter of some dispute, but they remained at least a curiosity among military professionals who sustained their use albeit meager.

19th Century Rocketry

The Congreve Era

William Congreve, who was to have a major impact on the growth of artillery rockets, was born in 1772 in Great Britain, three years before the United States Marine Corps was established. The importance of his appearance in history would be realized only some thirty-two years later when war rockets burst spectacularly back on to the battlefield. Congreve is now considered as the "Father of Modern War Rocketry."

At about this time, cannon artillery development had essentially reached the limit of its technological advance with smooth bore guns and mortars. There were no significant engineering contributions to either the range or accuracy of the heavy guns,

which were still essentially used during the British colonial wars in India during the 1700's. These wars produced the circumstances for the resurgence of artillery rockets.

The British clearly became interested at this point in the possibilities of this "new" weapon. William Congreve, later to be appointed a colonel in the Hanoverian Army, was the only individual the government was able to identify with a serious interest, if not expertise, in rockets. It also helped that his father was also the comptroller of the Royal Laboratory at Woolrich, where several unsuccessful experiments in rockets had been conducted some years earlier (6).

In the midst of this, the most significant and largest war in a century occurred. Between 1793 and 1815, Britain was almost continually at war with revolutionary and Napoleonic France. This conflict provided an impetus to the Congreve rocket program. By the fall of 1806, Congreve had what he felt was a final design of a steel-cased rocket with a tail shortened from an original 25 feet to 15 feet. The rocket had not only increased its weight to 32 pounds but had also increased its range now to almost 3,000 yards. Congreve's rocket was ready for war.

Finally, on the 8th of October 1806, the first rockets were used by the British in combat. They were launched from British naval barges towed by warships and manned by Royal Marine Artillery (7). Approximately 200 were fired against the city of Boulogne. The effect of the barrage is the subject of some dispute. They appear to have done little direct damage and were allegedly ridiculed by French soldiers. However, they did cause

considerable secondary damage through fires. Congreve and the British government considered them a success (8).

One year later, the British fired a reported 25,000 rockets at the French Fleet in Copenhagen, burning the city to the ground. The war rocket was proving itself an effective implement of battle. The enemy wasn't laughing anymore.

Regardless of his detractors, Congreve continued to promote the employment of his rockets. Their use at the Battle of Liepzig in October 1813 was credited by some historians with inflicting extensive casualties and damage to the French. The Rocket Brigade saw considerable combat up to and including Waterloo; however, afterwards Wellington was rumored to have directed his rocket commander to trade his rockets in for field guns (9).

Congreve's contributions to his country were eventually recognized by his being knighted. His rockets were, in fact, significant in many conflicts to come. His vision and ingenuity clearly provided the foundation for the development of military rocketry which has evolved into contemporary state-of-the-art technology for artillery rockets.

"The Rockets' Red Glare"

In Perilous Fight a detailed account of the Battle of Bladensburg, Neil H. Swanson provides some excellent insight into what it was like for those U.S. Marines who first experienced artillery rocket fire there:

> There is something personal about these hurtling, fire-spouting things. You can

> see them come... The truth is that aiming is largely a matter of hope and intention. This new weapon is at least as inaccurate as it is fear-inspiring... They fly every which way. But that it won't gush flame in your face and take three idiotic leaps and come darting back to bury its red-hot metal tip in your guts... That is the weakness of rockets: their flight cannot be controlled. But the rocket barrage scarcely aimed is not aimless... The rockets come with a hoarse, whooping roar. They pass close to overhead with a roar like a storm wind in a chimney... Oh, God... rockets again...not rockets...God, don't let them use rockets (10).

As a result of this encounter, the British were able to break through the meager American defenses, and continue their attack to the north. There they bombarded Fort McHenry in Baltimore, where the employment of their rocket ship, the H.M.S. Erebus, inspired Francis Scott Key to pen our National Anthem. Eventually, the British would lay siege to the city of Washington, burning it to the ground, sparing the house of the Marine Commandant. It has been theorized that this building was not destroyed out of respect for the Marines in acknowledgment of their valiant stance at Bladensburg.

Sir William Congreve died in May 1826; his death ended the first phase of modern rocketry. The legacy of his desire and motivation to make rockets an integral part of modern weaponry soon began to fade. The next resurgence would again intertwine the British and Americans.

Hale's Influence

The next stage again involved the Royal Laboratory in

Woolrich. In 1846, an English inventor, William Hale, entered rocket history by improving the designing of the Congreve rocket. Rockets known for their erratic behavior in flight and their poor accuracy were improved significantly by Hale, through his addition of fins at the base of the rocket. These fins, or "curved vanes", were used in conjunction with "tangential holes at the periphery of the base" (developed by an American inventor named Court) to replace the stick used by Congreve for stability in flight. Hale rockets had a little less range (2000 yards) than Congreve's but provided a quantum jump in accuracy. Some erratic flight behavior was reduced, and rockets' ability to hit their assigned target was beginning to approach that of cannons. The Americans then became more interested than the British military; with Hale's help the U.S. began manufacturing rockets after purchasing their rights for $20,000 (11).

Mexican War

The Arsenal in Washington, D.C., under the supervision of the Ordnance Department of the U.S. War Department, was responsible for the development of the Hale war rocket. In December 1846, the first American rocket battery was formed at Fort Monroe. General Scott in Mexico had briefly experienced the Congreve rockets in 1814. Based on that, the General authorized that a rocket troop be sent to his army at Vera Cruz in early 1847. Six rocket "dischargers" and soldiers joined Scott in Mexico. Most probably as a result of their inherent disadvantages - particularly range, logistics and battlefield signature -

the U.S. rocket-howitzer troop was disbanded in 1848 (12).

Civil War

At the outbreak of the Civil War in the United States, an experimental battery known as the 24th Independent Battery, New York Light Artillery, U.S. Volunteers, was formed in Albany New York. Its armament consisted of dischargers or launchers described as "breech-loading field pieces with a range of 5300 yards." The launcher was constructed of an eight foot section of wrought iron tubing which was perforated with 1 inch holes over its entire length. Another 3 inch diameter launcher made of 3/4 inch spirally-coiled wire was also developed. Both launchers were initially mounted on tripods with, plans to adapt them to standard gun carriages (13).

Later, the Union apparently decided against using rockets, although they were not ignored completely. The Confederate Army reported employing rockets under the command of J.E.B. Stuart, who fired them at McClellan's Union troops at Harrison's Landing on 3 July 1862. The South also used rockets sporadically in Texas from 1863-1864. The Confederacy purchased some of their rockets, but it also had only limited manufacturing capabilities, initially at Galveston and then at Houston (14).

Artillery Dominates

During the period from 1850 to 1900, use of war rockets began to decline more rapidly because of the invention of rifled

cannons and recoil mechanism for artillery. It soon became obvious that artillery was now far more accurate than the rockets; also, it was quickly developing a range capability in excess of either Hale's or Congreve's ordnance.

THE TWENTIETH CENTURY

World War I

Just prior to World War I and continuing through that conflict, there were several minor efforts to develop rockets for both underwater and aerial combat uses. The torpedo research did not lead anywhere, but the work on air-to-air and air-to-ground rockets for aircraft showed promise and a glimpse of the future of air power. Both the French and the Russians demonstrated during the war with varying degrees of success that their pilots could launch rockets which were strapped on the underside of the aircraft wings at targets; occasionally they hit something. The French were more interested in eliminating enemy observation balloons and zeppelins, while the Russians were already understanding the value of close air support for their infantry on the ground. Some use was also made during World War I of both signaling rockets and the commercial line carrying versions, which helped certain units clear barbed wire obstacles forward of their trench lines.

These attempts, to resurrect the war rocket were at best half-hearted and virtually unpublicized. Only after certain key events took place well into the century did the artillery rocket

again gain the interest, and subsequent funding, of several governments.

World War II

Nebelwerfers

It is difficult to state unequivocally whether the Germans or the Russians were the first to re-establish the vitality of the artillery rocket. This is primarily due to the scarcity or unavailability of Soviet records on their rocket development. The German interest in rockets is extremely well documented, so it provides at least a good starting point.

The Germans

The first modern multiple rocket launcher (MRL) was considered "one of the most effective and most sophisticated pieces of rocket artillery used in the war" (15). It was initially employed on the Russian front where, in 1942, the Russians reported a "new German minethrower." As its name, "Nebelwerfers", implies(smoke shell mortar), it was originally intended to provide effective chemical and smoke. It was just coincidental that its inventor's name, Nebel, was also the common military term for "smoke" in Germany at that time (16).

As the Nebelwerfer's performance improved and its value was realized, the Germans designed a number of variants. One version, the Panzerwerfer 41, saw the rocket launcher slightly reconfigured and mounted entirely atop a Maultier half-tracked

vehicle. This was necessary to ensure that the rocket launcher batteries could keep up with the Panzer units. This Panzerwerfer 41 could carry its own ammunition and was fired from inside the half-track. It was used extensively on all fronts.

The Katyusha

Within three months after the Germans invaded Russia in World War II, the Soviet Union deployed their Katyusha rocket system nicknamed "Stalin's Organs"(sic) by the Nazis. The Katyusha was actually a name for a series of multiple artillery rocket launchers that gained almost lengendary fame in Russia during the war; they have been highly regarded in the Red Army ever since.

The Russians

The "rocket institute" in St. Petersburg was headed by a General Konstantin Ivanovich Konstantinov, who is acknowledged as the first true pioneer of Russian rocketry. Under his direction from 1847 to 1871, the military rocket program successfully designed and employed 2-inch tripod-mounted rocket launchers that were effective in the defense of Sevastopol during the Crimean War. Despite a lack of hard documentation, some military historians believe that the Russians also were using ship-launched rocket systems at this time. These weapons were considered by the Russians to be effective in "crushing the reserves" and "with surprising accuracy...widening the breaches caused by artillery" (17).

By the early 1930's, the Soviet Union had increased their program to manufacture modern artillery rockets at their Gas Dynamics Laboratory in Leningrad (formerly St. Petersburg). The military engineers who had worked on the older Russian aircraft rockets proposed "to build a multi-barrel launch unit...as part of the armament of the land forces" (18). This idea came to fruition in June 1938, when the Scientific Research Institute of Rockets began work on a 132 mm, 24-tube system. After several faltering steps, six test weapons mounted on trucks were readied and tested during the summer of 1939.

Production of rocket launchers continued at a rapid pace; in fact, the Russians intended to field regiments of rocket artillery by the end of 1941. In sheer numbers, the Soviets had 424 launchers deployed on their western front by late 1942 and almost 1700 weapons by 1943. Before the end of the war, they had formed seven Guard Rocket Barrage Divisions consisting of two or three rocket barrage brigades or regiments capable of supporting major attacks and disrupting large-scale enemy assaults. There were also numerous separate rocket brigades assigned to the Breakthrough Artillery Divisions. The Raketnyye Voyska, or Rocket Troops, were made a legend by the Soviet press (19).

In his history of Russian rocketry, Ivan Slukhai provides some insight into the developing image of Soviet rocket units:

> The most characteristic traits in the combat exploits of the first rocketeers were their sudden appearance at the most difficult sectors of the front: their...ability to fire a maximum of explosives at the enemy within the shortest possible time, when necessary, their ability to shatter the enemy morally

> and as well as physically. These and other traditions of the Second World War took root among the rocketeers. They have been further strengthened and developed, and have become a standard...(20)

As noted British historian and strategist Sir B. H. Liddell Hart points out, the Russians were seriously lacking in artillery technology, especially in fire direction and control. As a result they compensated by using massive concentrations of artillery which led to their development of the concept of "breakthrough artillery". Not only were their fires concentrated, but so was the actual positioning of the field howitzers. This was clearly "suicidal" and they recognized it. As Liddell Hart explained, "The Russians have been attempting to overcome this problem by improvements in their fire control equipment ... and the accuracy of their weapons; at the same time there is evidence that they are attempting to develop heavy concentrations of fire through the use of multiple rocket launchers...(which) can provide a tremendous volume of fire in a short period of time and then have to move off to a safe location before counteraction can be effective." (21)

The Re-birth of the U.S. War Rocket

Although it was not comparable to the German rocket program or even to the Katyusha employment by the Russians, the American rocket development was probably far more extensive then was generally recognized. By the end of the war, the Army was spending at the rate of $150 million per year on rockets, while

the Navy's expenditures exceeded $1 billion! There were over 1200 rocket manufacturing facilities across the United States serving the Navy program.

U.S. Army Ground Rockets

The best known of all the rocket ordnance during the Second World War was the Bazooka, named after a folk musical instrument made popular on a national radio show. The weapon was a 2.36-inch anti-tank system developed by an Army Colonel, Leslie Skinner, in collaboration with C.N. Hickman. Its shaped-charge warhead proved very successful at penetrating armor during test firings. It was rushed to the North African front in great secrecy in September 1942; without benefit of training U.S. soldiers learned to use the weapon in combat through trial and error (22). A 3.5-inch model was later designed and employed during the Korean conflict.

Skinner and Hickman also teamed up to develop the most successful barrage rocket systems produced and employed during the War. The 4.5-inch rocket formed the basis around which most of the artillery rocket launchers used by the U.S. Army in Europe were designed. The Army saw distinct advantages in the artillery rockets, with a range out to almost 4000 meters. Their light weight and small crew allowed them to go almost anywhere; they could fire a large number of projectiles over a broad area, which often left the enemy unable to take cover.

The first artillery multiple rocket launcher to be placed into service by the U.S. Army was the T27, or "Xylophone" as it

came to be called. It had eight 7.5 foot tubes mounted side by side on a GMC or Studebaker 2-1/2 ton truck. Like most systems that were developing in the field artillery, the 4.5-inch rockets (MB) were fired in a "ripple," which meant that they were fired singly in rapid succession. This technique was helpful in reducing the blast effect on the next rocket; it is still employed in today's multiple rocket systems.

The T27 was widely used throughout the European conflict by the Army. The 1st Army converted a 105 mm howitzer battalion (18th Field Artillery Battalion) to a T27 rocket battalion in November 1944 and reported "excellent results" when it saw action in the Hurtgen Forest during the Battle of the Bulge. However, there were some legitimate criticisms that "the artillerymen were not enthusiastic, disliking the inaccuracy of the rocket and the smoke and flash that attracted counterbattery fire." The battalion continued to work with the weapon system, developing the now familiar "shoot and scoot" tactics which demanded increased mobility. They also saw the potential to use the jeep as a platform to gain mobility (23).

The Army had also experimented with some 7.2-inch systems. They were of very short range (210-1098 meters) and were basically employed as direct fire demolition rockets. A tank-mounted version the M17 (T40) with twenty rockets saw action in Europe in 1944, gaining the name "whiz-bang". It could not be considered a true artillery weapon because it was used only in a direct firing mode.

The Marine Buck Rogers' Men

No detailed account of the beginnings of multiple rocket launchers in the United States Marine Corps would make sense unless some background about the rocket systems employed by the U.S. Navy in support of amphibious landings. The United States Navy quickly recognized the significant advantages of surface-mounted rockets aboard a ship. The British had demonstrated their utility not only in the Second World War but also as far back as the War of 1812. Based on the Royal Navy's "Hedgehog" and "Mattress" systems, the United States Navy added rocket motors and longer rails and used a 4.5-inch tube. Some of these systems were tested in firings from landing craft off the coast of Camp Pendleton, California. The primary purpose, as the development engineers saw it, was to provide more substantial pre-assault bombardment for amphibious operations. The Marine Corps had agreed in early 1943 to the use of their base on the West Coast for rocket testing of both sea and land-based systems. Eventually, they were to form a Rocket Battalion under the command of Major Valentine Hoffman for test and training purposes only. This was to be the Corps' first real involvement with war rockets (24).

During the war, the U.S. Navy engineers worked with numerous other rocket systems for attacking submarines and other surface ships. They also developed air-to-surface and air-to-air systems which were precursors for today's high technology in aircraft rockets. The rocketships have since disappeared from the Fleet, as have many other naval gunfire weapon systems that are still

critical to landing amphibious forces on hostile beaches. This paper will not discuss the paucity of surface devlivered weapons systems in the Navy's inventory.

Almost seven months before the U.S. Army deployed multiple rocket launchers in Europe, the U.S. Marines were using them in combat in the Pacific. It is difficult to surmise how this occurred, since no available documentation accounts for the sequence of events. One can only conclude that as a result of the Navy's extensive employment of amphibious assault landing craft fitted with rocket launchers from December 1943 on, the Marines quickly recognized the practicality of the system and moved rapidly to introduce the same system to the land battle. Some of the Corps' first rocketeers on Saipan reported that due to the paucity of rocket ammunition for the Marines they were forced to borrow ordnance from their Naval counterparts (25).

The first two Provisional Rocket Detachments were officially designated on 13 April 1944. They eventually grew to six; all would see action in the Pacific. First Lieutenant Richard A. Brenneman, USMCR, became the Marine Corps' first commander of rocket troops; later, First Lieutenant James O. Newpher, USMCR, assumed command of the 2nd Provisional Rocket Detachment. The 1st Prov Rkt Det (USMC abbreviations) was attached to the 4th Marine Division of the V Amphibious Corps in Maui, and the 2nd Det was assigned to the 2nd Marine Division. A detachment consisted of one officer and fifty-seven enlisted Marines, most of whom learned their trade through "on the job training".

After Saipan, the Marine rocketeers saw action in most of

the island campaigns. Sergeant George Doyling wrote in July 1944 in "The Buck Rogers' Men" (published in the Leatherneck magazine nine months later for security reasons) that "when the Marine rockets went into action on Tinian, the Japs thought we were using automatic artillery" (26). He went on to describe how the Marines had fitted "recon trucks" (jeeps and 3/4-tons) with twelve launchers each, which were mounted over the rear axle and fired electrically from the cab. These were the 4.5-inch rockets (MB) used in the T45 model launchers. Although there is no written documentation, photographic evidence obtained showed that the Marines also experimented with tank-mounted multiple rocket launchers in the Pacific during the war.

An article that appeared in the Marine Corps Gazette just after the war entitled "Why not Rocket Artillery?", written by a Lieutenant Colonel Floyd R. Moore, USMC, highlighted many of the advantages and disadvantages already mentioned. Moreover, Colonel Moore noted that the Corps was studying the T66 24-tube rocket launcher that used the improved Army 4.5-inch rocket and provided a significant increase in range. He recommended that the Marines adopt a rocket battalion of three batteries equipped with twelve launchers each. In his words, "such a battalion attached to a Marine Division would more than double the fire power of its field artillery" (27).

It is difficult to judge whether Headquarters Marine Corps acted on LtCol Moore's suggestion or whether decisions were made esclusive of any outside influence. Regardless, the United States Marine Corps did actively pursue tests through their

research and development activity, the Marine Corps Equipment Board, located at the Marine Barracks in Quantico, Virginia. The tests proved satisfactory and the T66E2 Multiple Rocket Launcher with its M16 4.5-inch rocket was adopted for use with Marine artillery in late 1946 or early 1947. However, Headquarters Marine Corps did not field a battalion; rather they officially approved only one 4.5-inch rocket battery of 18 launchers for each division (28). These batteries were assigned to the artillery regiments and remained active up to and through the Korean War.

Korean War

Russian Development

Rocket launchers also continued in active service with the Soviet Forces after the Second World War. In 1954, an entire new line of weapons replaced the Katyushas. The Soviets viewed the rocket launchers as integral to their forces to counter "enemy missiles and nuclear weapons, and to overcome small pockets of resistance, and also destroy enemy tanks."(29) There therefore believed it essential that the development of artillery rockets continue. Although most of the 1954 systems have now been phased out of Soviet and Warsaw Pact inventories, they are still active in the armed forces of Afghanistan, China, Egypt and Somalia. It was also about this time that the FROG (Free Rocket Over Ground) appeared with the Division Artillery Group (DAG). These systems provided the Soviets with both conventional and nuclear capabilities at much increased ranges, up to 60 kilometers.

With this new stage of Russian rocket modernization, the BM-21 would become the standard multiple rocket launcher system for Soviet Forces. Although the weapon did not appear in public until the early sixties, it became the mainstay of Warsaw Pact rocket forces and remains so to this day. The 40-tube launcher is mounted on a truck, usually a URAL-375D (6x6). But more recently it has been mounted on the modernized Czech Tatra 813 (8x8) armored truck, which is capable of carrying additional ammunition.

Soviet artillery rocket development continued in 1977 with the arrival of the BM-27, a 220mm rocket system with a range of 40 kilometers. The BM-27 is the replacement for the BM-21 and is currently used only in Soviet forces.

U.S.M.C. Developments

During this period, the United States Marine Corps Equipment Board was reinforcing the Marine Corps position on the value of rocket launchers in combat. In its "Study on Marine Corps Equipment Policy" published in January 1951 and signed for the Commandant by Major General Merwin Silverthorn, USMC, Chief of Staff, the Board clearly saw a future requirement for a light and portable rocket launcher. The Board determined that a system not weighing more than 2000 pounds with a range of 12,000 yards was necessary. Although the Board did not see any need to pursue larger, heavier rocket systems to replace conventional artillery, it stated that the Marine Corps "should maintain an active interest in this category of equipment until such time as re-

search and development indicates an attainable accuracy and lethality equivalent to that of the comparable cannon."(30)

Marines in the Korean War

During the Board's study planning in Virginia, Battery C rocketeers were putting "hot steel on target" along the western and central front north of Inchon. Battery C, redesignated 1st 4.5-inch Rocket Battery on 1 January 1952, was attached to 11th Marine Division. They were equipped with six T66E4 launchers, six prime movers (6x6 2 1/2-ton trucks), three supply trucks and four 1/4-ton jeeps for reconnaissance and general motor transport.

In August 1952, the rocket battery engaged in what was then considered a "tactical innovation" (31). In close coordination with the medium helicopter squadron HMR-161, the Battery trained, rehearsed and employed artillery rockets in a heliborne role. This was the first instance of supporting arms being lifted to forward positions by helicopters. The invention was mothered by the necessity to "shoot and scoot," due to the rockets' signature effect of drawing counterfire (32).

Marine Corps Gazette articles appearing in 1952 and 1953 strongly supported the rocket launcher as a viable component of Marine supporting arms. Positive comments concerning the rocket's ability to surprise the enemy with concentrated mass fires on area targets and "reinforcing direct-support artillery in preparation fires" all highlighted the obvious advantages of rocket launchers (33).

Post Korean War

After Korea, the Marine Corps briefly explored replacing the T66E2/E4 rocket launcher, now designated the M21. In 1955, an evaluation performed on the T129 by the Marine Corps Development Center, formerly the Equipment Board, was based on a request from Headquarters Marine Corps that stated "Although the Marine Corps does not have a requirement for the T129 (6.5-inch) Multiple Rocket launcher, a requirement still exists for an area saturation-type weapon." Tests on the T129, a longer range (13,790 yard) and more accurate system which also needed a larger crew, were concluded: the evaluators felt than that the new rocket launcher did, in fact, fill the requirement (34).

The following year in November, after the Army had moved away from the 6.5-inch rocket launcher, the Marine Corps decided against the T129 replacing the 4.5-inch system, ostensibly because the trade-off of increased weight for increased range was not satisfactory "from a logistical standpoint" (35). This was evidently the death knell for the Marine Corps multiple rocket launcher. By the early 1960's the artillery rocket could be looked upon only in retrospect.

DEVELOPMENT OF TODAY'S ROCKET SYSTEMS"

Following the Korean Conflict, while assessing the need for a tactical nuclear system with extended range for use in the European theater, the Army began development which eventually led

to the Lar d Pershing missile systems. However, Army interest i ckets did not totally abate. Eventually, the Army saw a conve tional, general support rocket system as a requirement in the early 1970's. Because of the increased Warsaw Pact threat facing the Army in Europe, the Army saw a need to be able to attack critical, time-sensitive targets. In the early-to-late 1970's, the Army became interested in the Slammer, a series of 2.75 inch aerial rocket pods mounted on a trailer. But due to questionable lethality and range, the Army lost interest in this system.

MRLS Development

Following developmental testing, the Army acquired the Multiple Launch Rocket System (MLRS) in 1981 (36). About the same time, Marine interest centered upon the Field Artillery Rocket System (FARS), 5-inch Zuni rocket pods mounted on a trailer (37), and the Hydra, a system incorporating pods of 2.75-inch rockets (38). Although accused by the Aviation Branch as "misguided interest" (39), the Marine Corps saw a real need for a mass destruction weapon system. Unfortunately, issues regarding short range and lethality raised questions that resulted in the Marines' decision to drop the FARS and Hydra (40).

In the mean time, the Army culminated its development efforts in the early 1980's by awarding a contract to acquire the MLRS. The Marine Corps recognized the need for a rocket system of this type at this time, but it remained unfulfilled (41).

The Army MLRS System

The Army's MRLS is a tracked, self-propelled, all-weather rocket system capable of launching twelve 227 mm rockets in a single ripple of approximately 60 seconds, or of engaging targets individually with single rockets. The armored Self-Propelled loader-launcher (SPLL) is operated by a crew of three men and provides an automated positioning and firing capability. The MRLS on-board communications system and fire-direction computer are digital; they provide a burst transmission link to higher and adjacent headquarters. The MRLS is produced by the LTV Corporation and is presently able to deliver 644 (M77) anti-material/anti-personnel grenades (Dual Purpose Improved Conventional Munitions) per rocket. It is air transportable by both the C-141 and C-5A aircraft.

The MRLS is highly mobile and is designed to augment cannon artillery in its suppression, counterfire and interdiction roles. It may be used in the general support (GS), general support-reinforcing (GSR), or reinforcing (R) role as an indirect fire area artillery weapon system. The inherent responsibilities of each of these missions are similar to those for tube artillery (42). It will provide additional firepower while freeing tube units for the direct support (DS) role (43). The MRLS current range is 30+ kilometers (unclassified), but in view of current munitions development its range will increase to 100+ kilometers.

Army Organization for MRLS

The Army is presently organized to utilize the MRLS battalion (3 batteries of 9 launchers each) as a corps asset, either independently deployed or attached to a field artillery brigade within the corps. The battalion is organized to provide rocket fires in support of the corps as well as to reinforce other corps artillery units. In addition, an MRLS battery (9 launchers) is organic to the divisional artillery (DIVARTY) of the Army's heavy divisions (mechanized and armored), which provides general support fires for the division. Batteries organic to DIVARTY are virtually identical to those within a corps MRLS battalion (44).

Army MRLS Employment

MRLS is employed for general support and general support reinforcing at the DIVARTY level. Further, the battalion can be used in a reinforcing, general support reinforcing, or general support role at the corps level. It can be used not only for the attack of deep, high-payoff targets: it can as well augment tube artillery suppression of enemy air defense, counterfire, and interdiction (45).

The MLRS' value in augmenting tube artillery by providing additional firepower is very evident: one rocket with 644 submunitions equals 7.3 rounds of 155 mm (88 submunitions per round) or 3.5 rounds of 203 mm (182 submunitions per round) (46). Thus

a single launcher with 12 rockets equals or exceeds the massed firepower (one round per tube) of 11 batteries of 155 mm howitzers or 7 batteries of 203 mm howitzers. Even though the overall concept is to augment the fires of tube artillery, it must be noted here that the 203 mm howitzer is reaching the end of its service life. So the Army's intends to eventually replace all 203 mm howitzers with MLRS (47).

Marine Corps interest in MLRS

In view of the Army's success with employing the MLRS, and the Marine Corps' apparent lack of interest in rocket systems following Korea, one might ask, "Why should the Marine Corps be interested in such a system?" This is a very valid question. Certainly the system has its drawbacks including cost and logistics. Yet the system does offer some significant advantages especially in light of the Marine Corps' concept of deploying as a Marine Expeditionary Brigade (MEB) and employing as a Marine Expeditionary Force (MEF). Also, Marines must consider the system's potential employment in conjunction with "Maneuver Warfare."

We know that many Warsaw-Pact and Third World nations are now equipped with Soviet mechanized, armored, and rocket units: What will the Marine Corps need to face them in future conflicts? The intensity and complexity of warfare has increased due to extended engagement distances, very mobile armored forces, and shorter duration of engagements due to those highly mobile forces

being placed in armored formations.

In such an environment, the commander of a Marine Air Ground Task Force (MAGTF) is going to need more firepower than three or four battalions of artillery can provide him. He will have to mass his fires repeatedly and with great intensity if he is going to succeed in his mission. Under these circumstances, a rocket launcher becomes a very useful weapon system. Its major characteristics of heightened volume of fire, shock, and surprise effect fulfill a definite requirement for the massing of fires on high priority targets.

Also we must consider the current age of Marine corps general support weapons systems. The 155 mm self-propelled howitzer will probably remain in both the Army and Marine Corps inventories for some years to come, since it is the mainstay of artillery support for Army heavy divisions and provides needed self-propelled support for the Marine Corps. But the same cannot be said for the 203 mm howitzer. The Army has opted not to extend the service life of that system and in the very near future the Marine Corps will find its logistics base disappearing. The logistics base for the 155 mm will remain open through the Army, but the Marine Corps cannot afford to develop its own logistics base for the 203 mm by becoming the primary inventory control agency for it.

The Marine Corps may run into the same problem it now faces with the 105 mm howitzer: difficulties in trying to maintain it as a logistically supportable weapon system. In light of the

disappearance of one GS artillery battalion per regiment, as well as current tube artillery reductions in the remaining GS battalions, the Marine Corps cannot afford further reductions due to aging weapons systems. It must consider a replacement now for the 203 mm howitzer. A bold and aggressive use of the artillery available by means of flexible command and control and organizations for combat will temporarily diminish the problem, but the Corps must nonetheless address long-term considerations for additional fire support.

THE ACQUISITION OF THE ARMY MLRS FOR THE MARINE CORPS GS SYSTEM

Disadvantages

While an exhaustive list of the system's disadvantages is not necessary for the purposes of this paper, a few of the major problems associated with the Marine Corps' purchase of the MLRS require discussion. The first of these problems is the cost. Currently, the cost of one MLRS launcher is approximately 2.3 million dollars (48). Wholesale acquision can then become an expensive proposition. However, the increase in combat power available to a MAGTF commander must be weighed, as must be done for every acquisition, against the cost. As such it appears, to this observer, to be well worth it.

Logistic Support

A second drawback is logistic support. The rockets are large and cumbersome; but, as pointed out in previous comparisons(49), while 30 days of ammunition for the MLRS is slightly heavier, its cube is smaller than the 203 mm howitzer. However, the acquisition of support vehicles to transport this load presents an additonal problem. A ripple of 12 rockets fired in less than one minute can expend a great deal of ammunition, so indiscriminate use of the MLRS against all targets cannot be contemplated. Current 5-ton trucks (M900 series) would not be able to provide the necessary ammunition resupply support. Acquisition of the MK 48 Logistic Vehicle System (LVS), which the Marine Corps is currently fielding in the Force Service Support Group and considering for logistic support to DS artillery units, would relieve this problem to a certain degree. Still, the additional costs of this logistics system must be considered. Prioritization of the overall targeting effort to identify high value targets for engagement by MLRS would aid in the justification for accepting these additional costs of the MLRS system.

Transport

An additional disadvantage to be considered is the fact that MLRS is not helicopter transportable. On balance, this is not an overly significant weakness, especially since the present DS weapon, the M198, can only be transported by the CH-53E. Further,

the GS self-propelled weapons are not helicopter transportable at all. The very fact that the mobility of these proven systems is constantly cited as a tactical shortcoming forces consideration of the same shortcoming regarding the MLRS.

Firing Signature

One last disadvantage to be addressed is its firing signature. Once the rocket is launched, the dust and smoke create a signature that can be visually easily identified, and the trajectory of the rocket can be identified electronically. This vulnerability has been overcome to a certain degree by the Army, through employment of "shoot-and-scoot" tactics: firing is followed by immediate launcher displacement. This requires in-depth planning of the battle zone to allow for the rapid movement of launchers and uncovering a large number of firing positions for their sites.

Advantages

While these disadvantages are significant and must be considered in light of possible acquisition, there are many advantages to the current MLRS fielded by the Army. Foremost among these is mobility. The M270 is a tracked vehicle, providing much greater cross-country mobility and speed in displacement for survivablility than current towed weapon systems. The M270 is lighter and smaller than the present 155 mm self-propelled tube systems (50);

this contributes to its compatibility with all present landing craft and the LCAC (Landing Craft, Air Cushion). In addition, it is capable of being airlifted by both the C-141 and C-5A aircraft, making its strategic mobility a point of considerable value. Ammunition weight and cube are similar to that of the present amphibious lift capability. In addition, the on-board fire control computer and navigation system allow for individual launcher employment or the massing of the fires of several launchers.

Increased Lethality

The advantage of increased lethality available with the MLRS has already been mentioned. This increased killing power is due largely to the numerous and diverse types of munitions available and under development for the system. At present, the M77 rocket fired by the MLRS delivers Dual Purpose Improved Conventional Munition (DPICM) to a range of 32 kilometers. The Marine Air Ground Task Force (MAGTF) Master Plan (52) calls for increased capabilities for counterfire and the development of a general support (GS) system with a range of 40 kilometers. The MLRS approaches this now. At present, tube artillery is capable of ranges up to 30 kilometers, but maximum charges fired to achieve this contribute heavily to tube wear. Developmental warheads for the MLRS include scatterable mines, terminal guided warheads, seek-and-destroy armor (SADARM), and chemical munitions. However, the most significant developmental munition is the Army

Tactical Missile System (ATACMS), which would extend the range to 100+ kilometers. While only two missiles per launcher can be employed, literally no launcher modification is required to greatly increase the capability of the system in terms of depth of attack.

An Off-the-Shelf System

An advantage for the Marine Corps lies in the fact that the MLRS has already been fielded by the Army. A proven, off-the-self system is ready for acquisition. But there would be some research and development costs associated with it. For instance, the computerized systems must be hardened against salt water associated with amphibious operations: But such adaptations would be minimal. In fact, the Army may be convinced to participate and gain a product improvement. Overall, limited developmental costs would be incurred.

Manpower Savings

Finally, there would be a significant manpower savings with the adoption of the MLRS. In these days of tight budgets and manpower reductions, this could provide some welcome relief and allow the excess personnel to be assigned elsewhere. The battery structure I propose calls for 5 officers and 71 enlisted (a crew of 3 is required to operate the launcher). This is similar to the Army internal launcher organization and is workable from a

Marine Corps standpoint. Compared with the present 203 mm battery of 5 officers and 105 enlisted, a significant manpower reduction becomes evident. A one-for-one replacement with the present 203 mm would result in significant decrease of 136 personnel in the overall artillery force structure. However, additional support personnel may be necessary.

Discussion of Advantages and Disadvantages

Numerically, the advantages definitely outweigh the disadvantages. However, if the MLRS were acquired, the Marine Corps must still determine how it will be employed. This matter has not been considered, because no decision to acquire the system has been reached.

Before developing a Marine Corps concept of MLRS employment, we must first examine how the MLRS would be employed and integrated into the maneuver warfare concept. The current cornerstone document for the Marine Corps, FMF-1, describes maneuver warfare extensively. By its very nature MLRS would readily lend itself to employment as a general support (GS) weapon system with which the maneuver commander can influence combat.

Maneuver warfare requires considerations of both space and time to gain a positional advantage and to generate a faster operational tempo to gain decisive superiority at the required time and place. Artillery has always been a maneuver element with its "wheels and trajectory." Attempts should be made to shatter the enemy's moral and physical cohesion through rapid,

violent and unexpected actions.

Basically, the maneuver commander must create a situation that will shock and surprise the enemy force, or one that will be critical to accomplishing these tasks. The idea is to shift combat power, defined as the sum of firepower and maneuver, to physical movement of maneuver units. MLRS, due to its capacity for mobility, lethality, surprise, and shock provides a resource for instant suppression and destruction of combat power at decisive places and times. It is capable of immediate response to a situation through massive coverage of a particular area of the battlefield.

Any joint munitions effects manual will bear out the increased effects of a first round, massed time-on-target (TOT) barrage as opposed to second and succeeding volleys. The key to the employment of the MLRS is the selective application of its massive capabilities against critical enemy vulnerabilities. This would lend itself to the GS mission, where control is centralized and exercised directly by the maneuver commander through his artillery headquarters. The commander seeks to pose dilemmas to the enemy so rapidly that he dictates terms of battle.

The commander actively works to seek out enemy vulnerabilities and concentrate his combat power against them. Rapid rates of fire and the capability to mass on one target or engage twelve individual targets from a single launcher provide a capability heretofore unknown to the maneuver commander. The munition pat-

tern fro- single rocket covers an area on the ground approximately 20[illegible] meters in diameter (53). The variety of warheads under development would give the commander a great deal of flexibility.

The present range capability of the MLRS approaches that called for in the Marine Air Ground Task Force (MAGTF) master plan. However, the advent of the ATACMS would allow the maneuver commander to engage extremely deep targets with surface-to-surface fire support in any kind of weather and over any type of terrain. Survivability of Marine air assets, the only system now capable of deep interdiction, as well as an overall savings of air sorties available, hang in the balance.

It is interesting to note that the Army organizes its defensive framework to include an area for deep operations. An Army commander has the MLRS, as well as Joint Air Attack Team (JAAT) operations, at his disposal to extend his area of influence and pursue deep operations. While the Marine framework considers three echelons -- security, main battle area (MBA), and rear -- and stresses deep attack (54), the only fire support asset available for deep operations is air, weather permitting.

Can the MAGTF commander afford to squander air assets and sorites -- or worse, let his vital mission requirements go unfulfilled -- w[illegible]here is an all-weather system available which would allow him to provide deep interdiction of enemy second echelon elements and counterfire? MLRS poses an exciting alternative for extending the MAGTF commander's area of

influence. Given proper intelligence regarding his area of interest and new capabilities for target acquisition (SRI group), he now has an additional capacity for attacking high priority targets acquired well beyond the security area.

RECOMMENDATIONS

If the MLRS is acquired, we must now turn our attention to the numbers of launchers the Marine Corps will require and how they will be employed. I recommend that the MLRS be procured to replace the 203 mm howitzer on a one-for-one basis. Based upon the currently proposed artillery force structure, this would require a total buy of 42 launchers (12 each for the Tenth and Eleventh Marines, and 18 for the Fourteenth Marines) for the active and reserve artillery component. This figure does not account for a maintenance or operational readiness float or for launchers for the Maritime Prepositioned Force. These matters must be considered as well.

Without doubt, we ultimately face the phase-out of the 203 mm howitzer. In addition, the active regiments face the loss of one general support (GS) battalion and one 155 mm howitzer battery. Thus we must acquire a replacement system to maintain firepower for the MAGTF. The austere tubed artillery assets that would remain without such an acquisition are totally inadequate. The Twelfth Marines would maintain their structure for general support (GS) artillery; and the Tenth, Eleventh, and Fourteenth

Marines would increase their GS capability with procurement of the MLRS. Furthermore, we would realize an overall manpower saving of 136 personnel for active artillery regiments and 102 personnel for the Reserve establishment.

The increase in firepower and lethality for the MAGTF commander would be substantial. Twelve launchers (two six-launcher batteries) of MLRS can provide the equivalent first-round firepower of 84 tubes of 203 mm howitzers (14 six-gun batteries) per Marine Expeditionary Force (MEF) with comparable embarkation characteristics to presently employed systems (comparison is based upon numbers of submunitions delivered in one volley).

An added advantage is the strategic mobility of air lift by C-141 aircraft. One battery (six launchers) of MLRS could be attached to the DS battalion of each MEB to increase the firepower of that organization. Upon compositing to form the MEF, one battery could provide general support (GS) fires to the ground combat element (GCE), and the other battery could provide GS fires to the MEF commander to take advantage of the SRI Group acquisition capability and allow him to formulate his own counterfire and interdiction programs.

Response to the GCE is critical, but the MEF commander must also have a means of increasing his area of influence and providing surprise by means of rapid and massively destructive fires upon his own priority targets within that area. MLRS supplies the MAGTF commander an all-weather, expeditionary, surface-to-surface, fire support asset which provides greater survivability

for aviation assets; particularly with the advent of ATACMS. Both the GCE and MEF commanders would now have a capability not only to extend their areas of influence but also to provide a means of destroying enemy cohesion through selective use of separate counterfire and interdiction programs within these areas. They would have the capacity to mass an element of combat power with a ferocity that has been totally unavailable in the past.

Current personnel within the artillery regiment (survey, meteorological, electronics and track repair) would preclude any real requirement for support personnel increases. The GS role for the MEF and GS, GSR role for the GCE would be appropriate with no real changes in the inherent responsibilities delineated in current Marine Corps doctrine (55). At the MEB level a mission of GS or GSR would be appropriate due to the need to strike high priority targets with mass destructive fires in accordance with the priorities set by the maneuver commander. However, the signature associated with those fires must be compensated for when planning zones of action. The maneuver commander must be aware not only of the MLRS mass destructive capabilities but also of the fact that its employment makes it a very lucrative target.

CONCLUSION

The Marine Corps has traditionally shown an interest in rockets either actively, as demonstrated by their use in World

War II and Korea and developmental testing of various lightweight systems, or passively, as demonstrated by continuous study and periodic mention in professional journals. The MLRS is an off-the shelf, expeditionary system which can provide the MAGTF commander the finest benefits of any rocket system, with an increased capability for counterfire and interdiction. It provides the commander with one of the simplest, most direct means of destroying enemy cohesion, the quintessential tactic in the maneuver warfare concept. The maneuver commander must concentrate on the enemy who, when considered in relation to a non-linear FEBA, may present many high payoff targets well beyond the capabilities of engagement of the present tube artillery systems. MLRS acquisition and employment would provide increased lethality, strategic mobility, and an overall enlargement of the area of the MAGTF commander. It would free up the DS units to concentrate on close support fires for the individual maneuver units.

The probable demise of the 203 mm howitzer, as well as reduction in overall numbers of tubes, demands the identification of a replacement system. The MLRS can exceed the present capabilities with an overall decrease in manpower requirements and without any increase in amphibious or airlift requirements. It is an expensive proposition, to be sure, but it will provide for an overall increase in fire support, as a subset of combat power. The MLRS will allow Marine Corps maneuver commanders to destroy enemy cohesion. It will save Marine lives and aircraft. Above all, it will win!

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